Algebra I

Core 40 End-of-Course Assessment
Item Sampler

INDIANA CORE 40

Indiana Department of Education
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Dear Colleague:

In the Core 40 End-of-Course Assessment Item Sampler, you will find information designed to guide, direct and clarify your efforts in preparing for and administering Indiana's Core 40 End-of-Course Assessments (ECAs). We want your students to be as well-prepared as possible when they take the Core 40 ECAs.

As high school teachers, your guidance and knowledge of the Indiana Academic Standards assessed on the Core 40 ECAs, and your familiarity with all aspects of test administration, are critically important to students' success on the tests and with the rest of their coursework. You influence their choices and futures, including their academic achievements.

We expect that the information provided in this sampler will arm you with the necessary material to help educate and motivate your students. Additional information about Core 40 End-of-Course Assessments is available online at www.doe.state.in.us/core40/eca.

Thank you for all you do to prepare students to meet the challenges they will face in this ever-changing and challenging world.

Sincerely,

Dr. Suellen Reed
Superintendent of Public Instruction

Introduction

The Indiana Department of Education (DOE) has developed item samplers to provide students, teachers, administrators, and the public with examples of the types of items that will appear on the End-of-Course Assessments (ECAs). IDOE staff, Indiana teachers, Indiana school administrators, and higher education faculty worked together to write and to edit items. The items went through a process of editing and review to improve, correct, or eliminate poor items.

These item samplers are not practice tests. They represent the types of questions that might appear on future ECAs and can serve as models when teachers are constructing test items for classroom assessment. The samplers include sample test items (questions) and scoring rubrics that reflect Indiana's Academic Standards. All items included in these samplers are samples only and are **not** actual test items. There are three types of test questions: multiple-choice, open-ended, and essay. Some of the open-ended questions require short written answers and other questions require longer written answers. The example of an essay question appears only in the English 11 item sampler.

A test blueprint was developed for each content area prior to test development. The test blueprints are public documents designed to communicate the content of the ECAs. The item samplers provide a breakdown, by approximate percent, of each standard covered. Although this information is included in the item samplers, the items selected and the Standards covered do not represent an entire assessment.

A condensed version of Indiana's Academic Standards is also included in each item sampler. They describe what all Indiana students should know and be able to do upon completing a course. Complete copies of the Standards can be obtained from the Indiana Department of Education or from the Web site http://www.doe.state.in.us/standards.

Frequently Asked Questions

What are Core 40 End-of-Course Assessments?
Aligned with Indiana's Academic Standards, End-of-Course Assessments are final exams measuring what students know and are able to do upon completion of targeted Core 40 courses. The Core 40 End-of-Course Assessments are designed to ensure the quality, consistency, and rigor of Core 40 courses across the state.

What are the stakes for schools?
As part of Indiana's School Accountability System under P.L. 221, the End-of-Course Assessments are indicators of school improvement and schools must participate in order to achieve the top two school performance categories ("Exemplary Progress" and "Commendable Progress").

Are students required to pass the End-of-Course Assessments?
This is a local decision. If schools choose to incorporate the ECAs into local grading, it is recommended scores on these assessments should not be used for more than one-third of a student's grade. At this time, there are no "stakes" for students at the state level.

How are special needs and LEP students accommodated on the End-of-Course Assessments?
The accommodations for the End-of-Course Assessments will be based upon those observed for ISTEP+. Generally, that means that a student will receive the same testing accommodations as those that occur throughout the student's education program. Please refer to ISTEP+ 2004-2005 Program Manual, Appendix G for more specific information: www.doe.state.in.us/istep/welcome.html.

How will test security for the required End-of-Course Assessments be handled?
Test security for the End-of-Course Assessments will be handled in a manner similar to ISTEP+. Teachers and students will not be given advanced knowledge of the test content prior to administration and testing materials may not be copied or printed. The Corporation Test Coordinator will be responsible for ensuring the security of all test materials and preventing unauthorized circulation of copies of the tests.

How are the items that appear on the End-of-Course Assessments developed?
Committees that consist of Indiana K-12 educators and administrators, higher education faculty, and IDOE staff work, along with the testing vendor, to review, revise, and approve items. A separate committee reviews the passages and items for sensitivity/bias issues.

Mathematics

Algebra I Indiana Academic Standards

- ❑ **Operations with Real Numbers**
  Students simplify and compare expressions. They use rational exponents and simplify square roots.

- ❑ **Linear Equations and Inequalities**
  Students solve linear equations and inequalities in one variable. They solve word problems that involve linear equations, inequalities, or formulas.

- ❑ **Relations and Functions**
  Students sketch and interpret graphs representing given situations. They understand the concept of a function and analyze the graphs of functions.

- ❑ **Graphing Linear Equations and Inequalities**
  Students graph linear equations and inequalities in two variables. They write equations of lines and find and use the slope and y-intercept of lines. They use linear equations to model real data.

- ❑ **Pairs of Linear Equations and Inequalities**
  Students solve pairs of linear equations using graphs and using algebra. They solve pairs of linear inequalities using graphs. They solve world problems involving pairs of linear equations.

- ❑ **Polynomials**
  Students add, subtract, multiply, and divide polynomials. They factor quadratics.

- ❑ **Algebraic Fractions**
  Students simplify algebraic ratios and solve algebraic proportions.

- ❑ **Quadratic, Cubic, and Radical Equations**
  Students graph and solve quadratic and radical equations. They graph cubic equations.

- ❑ **Mathematical Reasoning and Problem Solving**
  Students use a variety of strategies to solve problems.

NOTE: This page provides an overview of the Indiana Academic Standards. The IDOE Web site at **http://www.state.in.us/standards** contains a complete version of Indiana's Academic Standards, which may be downloaded.

Types of items on the Algebra I End-of-Course Assessment:

- **Multiple-choice –** The answer to the question can be found in one of four answer choices provided.
- **Numeric response –** The answer to the question is a number response that must be written on the answer line.
- **Short answer –** The answer to the question is a single expression or equation that must be written on the answer line.
- **Extended response –** The answer to the question is a graph or a written explanation that must be put in the space provided.

Indiana Core 40 End-of-Course Assessment
Algebra I Blueprint*

Approximate Weight**	Reporting Category	Standards Covered
40%	Linear Equations and Inequalities	Standard 2: Linear Equations and Inequalities Standard 4: Graphing Linear Equations and Inequalities Standard 7: Algebraic Fractions
10%	Sketching and Interpreting Graphs	Standard 3: Relations and Functions
15%	Systems of Linear Equations and Inequalities	Standard 5: Pairs of Linear Equations and Inequalities
20%	Polynomials	Standard 1: Operations with Real Numbers Standard 6: Polynomials
15%	Quadratic Equations	Standard 8: Quadratic, Cubic, and Radical Equations

*The test blueprint is a public document designed to communicate the content of the Indiana Core 40 ECA.

**The weight assigned to each category is the approximate percent of the total score points that category is assessed on the ECA.

Sample Test Items

Standard 2: Linear Equations and Inequalities

1 **The formula $W = \frac{Vt^2}{R}$ describes electrical energy, W, in terms of potential difference, V, resistance, R, and time, t. Solve the formula for V.**

✓ **A** $V = \frac{WR}{t^2}$

B $V = \frac{W - R}{t^2}$

C $V = \frac{R}{Wt^2}$

D $V = WR - t^2$

2 **An electrician charges a $45 basic fee and then charges $35 per hour. Write a formula that represents the total charge, C, in terms of number of hours, h.**

Answer: _____

Exemplary Response:

- $C = 45 + 35h$

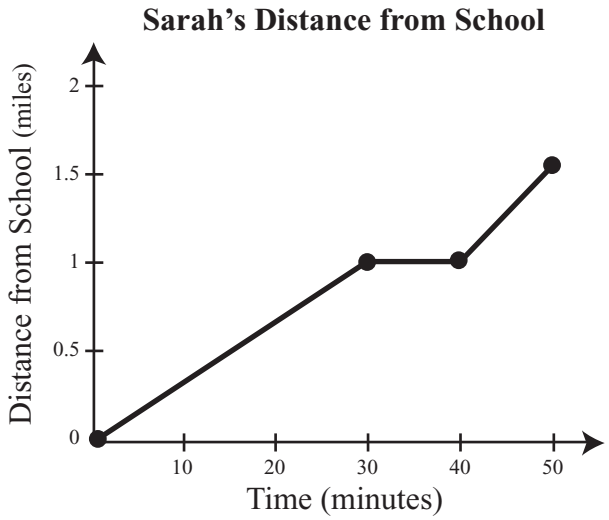
OR

- Other equivalent response

Rubric:

1 point	Exemplary Response
0 points	Other

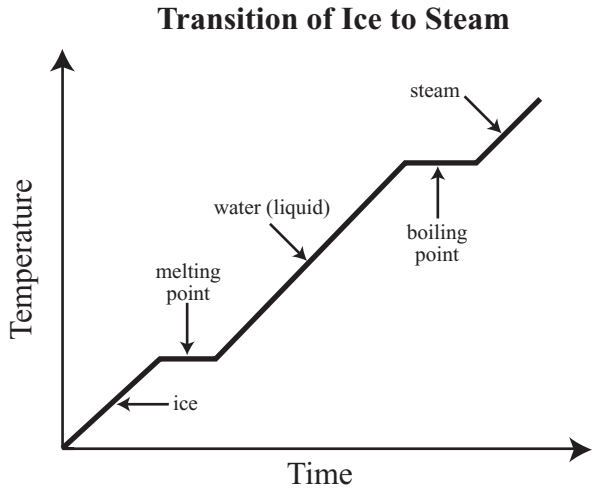
3 **Sarah left school and rode her bike home. The graph below shows the relationship between her distance from school and time.**



Which of the following explanations could account for the section of the graph from $t = 30$ to $t = 40$?

A Sarah rode her bike down a hill.
B Sarah ran all of the way home.
✓ **C** Sarah stopped at a friend's house on her way home.
D Sarah returned to school to get her mathematics book.

4 **The graph below shows the temperature of ice in a pan over a Bunsen burner as it changes from ice (solid) to water (liquid) to steam (gas) over time.**



Describe what is happening in the graph.

_____
_____
_____
_____
_____
_____

Exemplary Response:

- The ice increases in temperature until it gets to the melting point and stays the same temperature for a while; the water (liquid) increases in temperature until the boiling point then stays the same temperature for a while; then the steam increases in temperature.

OR

- Other valid response

Rubric:

3 points	Exemplary Response
2 points	At least three labeled components of graph correct
1 point	At least two labeled components of graph correct
0 points	Other

Standard 5: Pairs of Linear Equations and Inequalities

5 **What value of *y* satisfies the system of equation below?**

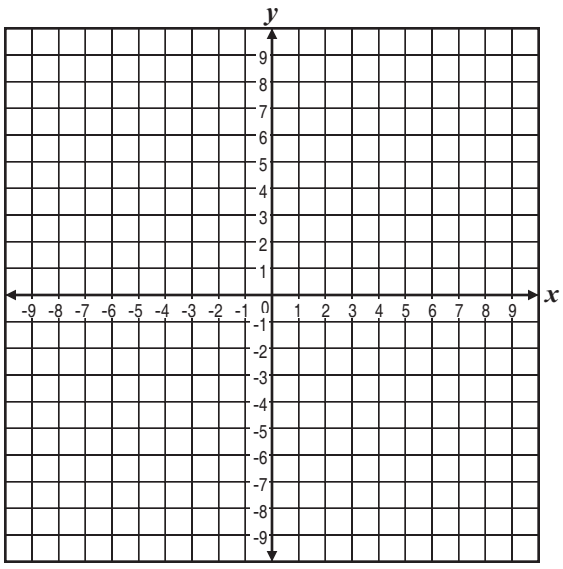
$$2x + y = 19$$
$$4x - 6y = -2$$

✓ **A** 5
B 7
C 8
D 10

6 **Consider the system of equations shown below.**

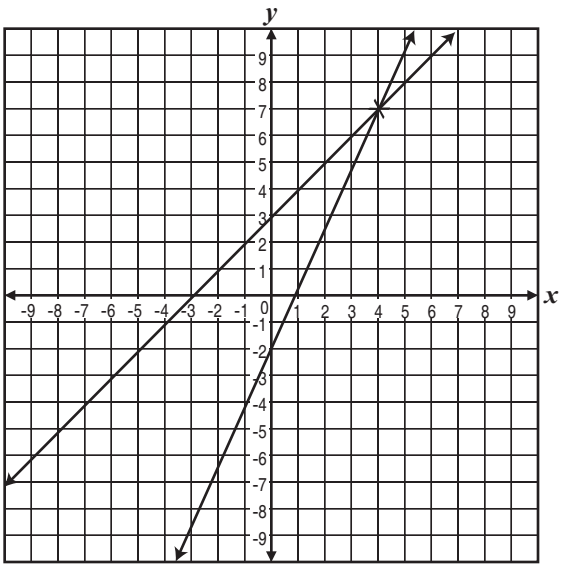
$$y = x + 3$$

$$y = \frac{9}{4}x - 2$$



A. Graph the system of equations.
B. Mark an x on the point that corresponds to the solution for this system of equations.

Exemplary Response:



- Correctly plotting the line $y = x + 3$

AND

- Correctly plotting the line $y = \frac{9}{4}x - 2$

AND

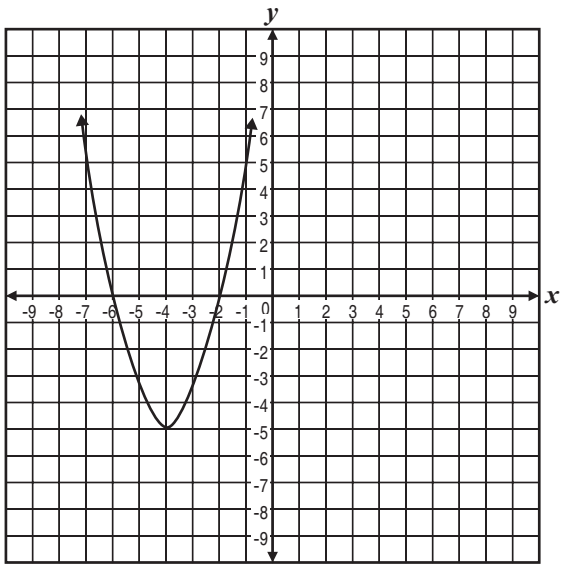
- Marking an x on the point that corresponds to the solution of the system of equations.

NOTE: Give credit for an x marked on the correct solution of incorrectly plotted lines.

Rubric:

3 points	Exemplary Response
2 points	2 correct components
1 point	1 correct component
0 points	Other

7 **Find the zeros of the function graphed below.**



A −4 and 5
B −1 and −7
C −4 and −5
✓ **D** −2 and −6

8 **Solve for u: $2u^2 + 9u = 18$.**

Answer: _____

Exemplary Response:

- -6

AND

- 1.5

OR

- $u = -6$

AND

- $u = 1.5$

OR

- Other equivalent response

Rubric:

2 points	Exemplary Response
1 point	One correct component
0 points	Other

9 **Solve for x: $\sqrt{2x + 8} = x$.**

Answer: _____

Exemplary Response:

- 4

OR

- $x = 4$

OR

- Other equivalent response

Rubric:

1 point	Exemplary Response
0 points	Other

10 **Factor $x^2 + 7x + 12$.**

Answer: _____

Exemplary Response:

- $(x + 3)(x + 4)$

OR

- $(x + 4)(x + 3)$

OR

- Other valid response

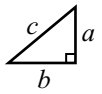
Rubric:

1 point Exemplary Response

0 points Other

Core 40 End-of-Course Assessment Algebra I Reference Sheet

Pythagorean Theorem



$a^2 + b^2 = c^2$

Distance Formula

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

d = distance between points 1 and 2

Midpoint Formula

$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

M = point halfway between points 1 and 2

Standard Form of a Linear Equation

$Ax + By = C$

(where A and B are not both zero)

Standard Form of a Quadratic Equation

$ax^2 + bx + c = 0$

(where $a \neq 0$)

Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

(where $ax^2 + bx + c = 0$ and $a \neq 0$)

Simple Interest Formula

$I = prt$

where I = interest

p = principal

r = rate

t = time

Equation of a Line

Slope-Intercept Form: $y = mx + b$
where m = slope and b = y-intercept
Point-Slope Form:
$y - y_1 = m(x - x_1)$

Slope of a Line

Let (x_1, y_1) and (x_2, y_2) be two points in the plane.

$$\text{slope} = \frac{\text{change in } y}{\text{change in } x} = \frac{y_2 - y_1}{x_2 - x_1}$$

(where $x_2 \neq x_1$)

Shape	Formulas for Area (A) and Circumference (C)	
Triangle 	$A = \frac{1}{2}bh = \frac{1}{2} \times$ base $\times$ height	
Trapezoid 	$A = \frac{1}{2}(b_1 + b_2)h = \frac{1}{2} \times$ sum of bases $\times$ height	
Parallelogram 	$A = bh$ = base $\times$ height	
Circle 	$A = \pi r^2 = \pi \times$ square of radius $C = 2\pi r = 2 \times \pi \times$ radius	$\pi \approx 3.14$ or $\pi \approx \frac{22}{7}$

Figure	Formulas for Volume (V) and Surface Area (SA)	
Cube 	$SA = 6s^2 = 6 \times$ length of side squared	
Cylinder (total) 	$SA = 2\pi rh + 2\pi r^2$ $SA = 2 \times \pi \times$ radius $\times$ height $+ 2 \times \pi \times$ radius squared	$\pi \approx 3.14$ or $\pi \approx \frac{22}{7}$
Sphere 	$SA = 4\pi r^2 = 4 \times \pi \times$ radius squared $V = \frac{4}{3}\pi r^3 = \frac{4}{3} \times \pi \times$ radius cubed	
Cone 	$V = \frac{1}{3}\pi r^2 h = \frac{1}{3} \times \pi \times$ radius squared $\times$ height	
Pyramid 	$V = \frac{1}{3}Bh = \frac{1}{3} \times$ area of base $\times$ height	
Prism 	$V = Bh$ = area of base $\times$ height	